Amendments to the Specification:

Please replace the paragraph beginning at page 1, line 11, with the following amended paragraph:

The present invention relates broadly to systems for measuring magnetic fields using flux licked loops and superconducting quantum ~~interface~~ interference devices. More particularly, the present invention concerns a system comprising an unmodulated or direct-feedback flux locked loop electrically connected by first and second unbalanced coaxial transmission lines to a superconducting quantum ~~interface~~ interference device.

Please replace the paragraph beginning at page 1, line 18, with the following amended paragraph:

Superconducting quantum ~~interface~~ interference devices (SQUIDs) are small, cryogenically-cooled magnetic field sensors comprising a ring of superconducting material interrupted by two Josephson junctions. SQUIDs are designed to detect changes in magnetic flux, and, when suitably biased with a small DC current, will exhibit a magnetic flux sensitivity noise floor of approximately 1 x 10-6 0/Hz for low temperature devices that operate near 4 degrees Kelvin (typically cooled by liquid Helium), and approximately 7 x 10-6 0/Hz for high temperature devices that operate near 77 degrees Kelvin (typically cooled by liquid Nitrogen). SQUIDs exhibit a transfer function that converts magnetic flux into a periodic electrical output signal.

Please replace the paragraph comprising the Abstract with the following amended paragraph:

A system (10) for measuring magnetic fields, wherein the system (10) comprises an unmodulated or direct-feedback flux locked loop (12) connected by first and second unbalanced RF coaxial transmission lines (16a,16b) to a superconducting quantum ~~interface~~ interference device (14). The FLL (12) operates for the most part in a room-temperature or non-cryogenic environment, while

the SQUID (14) operates in a cryogenic environment, with the first and second lines (16a,16b) extending between these two operating environments

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A system for measuring magnetic fields using a superconducting quantum ~~interface~~ interference device, wherein the system comprises:

an unmodulated flux locked loop operable to achieve a substantially stable operating point at the superconducting quantum ~~interface~~ interference device; and

a coaxial transmission line adapted to electrically connect the unmodulated flux locked loop and the superconducting quantum ~~interface~~ interference device,

wherein the unmodulated flux locked loop is located in a non-cryogenic environment, and the coaxial transmission line is adapted to extend between the non-cryogenic environment and the superconducting quantum interference device.

2. (Canceled)

3. (Currently Amended) The system as set forth in claim ~~2~~ 1, wherein the non-cryogenic environment is a magnetically unshielded environment.

4. (Original) The system as set forth in claim 1, wherein the unmodulated flux locked loop includes only linear, wide-band DC componentry.

5. (Currently Amended) <u>A system for measuring magnetic fields using a superconducting quantum interference device, wherein the system comprises:</u>

<u>an unmodulated flux locked loop operable to achieve a substantially stable operating point at the superconducting quantum interference device;</u>

<u>a coaxial transmission line adapted to electrically connect the unmodulated flux locked loop and the superconducting quantum interference device;</u>

~~The system as set forth in claim 1, wherein the unmodulated flux locked loop includes -~~

a controlled-impedance bias tee operable to send a bias current into the superconducting quantum ~~interface~~ <u>interference</u> device and to receive an output signal generated by the superconducting quantum ~~interface~~ <u>interference</u> device via the coaxial transmission line;

a low noise amplifier operable to amplify the output signal generated by the superconducting ~~interface~~ <u>quantum interference</u> device;

a loop gain adjustment for optimizing performance of the unmodulated flux locked loop;

a first DC amplifier for amplifying an output of the low noise amplifier;

a first integrator network operable to facilitate achieving a stable phase locked feedback of the output signal generated by the superconducting quantum ~~interface~~ <u>interference</u> device;

a second DC amplifier for providing a wideband signal gain;

an offset adjustment device for adjusting a DC offset of an output of the first integrator network;

a second integrator network operating in conjunction with the first integrator network to provide performance of a two-pole integrator; and

an output amplifier for amplifying an output of the second integrator network.

6. (Original) The system as shown in claim 5, wherein the first and second integrator networks are each a passive lead-lag network.

7. (Currently Amended) A system for measuring magnetic fields, wherein the system comprises:

a superconducting quantum ~~interface~~ interference device operable to detect changes in magnetic flux;

an unmodulated flux locked loop for achieving a substantially stable magnetic flux operating point at the superconducting quantum ~~interface~~ interference device by introducing a feedback magnetic flux that counteracts an externally applied magnetic field;

a first unbalanced coaxial transmission line for carrying a feedback signal corresponding to the externally applied magnetic field from the unmodulated flux locked loop to the superconducting quantum ~~interface~~ interference device; and

a second unbalanced coaxial transmission line both for carrying a bias current from the unmodulated flux locked loop to the superconducting quantum ~~interface~~ interference device and for carrying an output signal from the superconducting quantum ~~interface~~ interference device to the unmodulated flux locked loop,

wherein the superconducting quantum interference device is located in a cryogenic environment, the unmodulated flux locked loop is located in a non-cryogenic environment, and the first and second unbalanced coaxial transmission lines extend between the cryogenic environment and the non-cryogenic environment.

8. (Canceled)

9. (Currently Amended) The system as set forth in claim ~~8~~ 7, wherein the non-cryogenic environment is a magnetically unshielded environment.

10. (Original) The system as set forth in claim 7, wherein the unmodulated flux locked loop includes only linear, wide-band DC componentry.

11. (Currently Amended) The system as set forth in claim 7, wherein the unmodulated flux locked loop includes -

a controlled-impedance bias tee for sending the bias current into the superconducting quantum ~~interface~~ interference device and for receiving the output signal generated by the superconducting quantum ~~interface~~ interference device via the second unbalanced coaxial transmission line;

an impedance match for terminating the second unbalanced coaxial transmission line in a characteristic impedance of the second unbalanced coaxial transmission line;

a low noise amplifier for amplifying the output signal of the superconducting quantum ~~interface~~ interference device;

a loop gain adjustment for optimizing performance of the unmodulated flux locked loop;

a first DC amplifier for amplifying an output of the low noise amplifier;

a first integrator network for facilitating achieving a stable phase locked feedback of the output signal of the superconducting quantum ~~interface~~ interference device;

a second DC amplifier for providing a wideband signal gain;

an offset adjustment for adjusting a DC offset of an output of the first integrator network;

a second integrator network operating in conjunction with the first integrator network to provide performance of a two-pole integrator;

an output amplifier for amplifying an output of the second integrator network; and

a matching combiner for matching a characteristic impedance of the first unbalanced coaxial transmission line.

12. (Original) The system as shown in claim 11, wherein the first and second integrator networks are each a passive lead-lag network.

13. (Currently Amended) The system as set forth in claim 7, wherein the first unbalanced coaxial transmission line is impedance matched at the unmodulated flux locked loop and is not impedance matched at the superconducting quantum ~~interface~~ interference device.

14. (Currently Amended) The system as set forth in claim 7, wherein the second unbalanced coaxial transmission line is impedance matched at the unmodulated flux locked loop and is not impedance matched at the superconducting quantum ~~interface~~ interference device.

15. (Currently Amended) The system as set forth in claim 7, wherein the first and second unbalanced coaxial transmission lines are impedance matched at both the unmodulated flux locked loop and the superconducting quantum ~~interface~~ interference device.

16. (Currently Amended) A system for measuring magnetic fields, wherein the system comprises:

a superconducting quantum ~~interface~~ interference device operable to detect changes in magnetic flux;

an unmodulated flux locked loop for achieving a substantially stable magnetic flux operating point at the superconducting quantum ~~interface~~ interference device by introducing a feedback magnetic flux that counteracts an externally applied magnetic field, wherein the unmodulated flux locked loop includes only linear, wide-band DC componentry, and wherein the unmodulated flux locked loop is located in a non-cryogenic and magnetically unshielded environment;

a first unbalanced RF coaxial transmission line for carrying a feedback signal corresponding to the externally applied magnetic field from the unmodulated flux locked loop to the superconducting quantum ~~interface~~ interference device; and

a second unbalanced RF coaxial transmission line both for carrying a bias current from the unmodulated flux locked loop to the superconducting quantum ~~interface~~ interference device and for carrying an output signal from the superconducting quantum ~~interface~~ interference device to the unmodulated flux locked loop.

17. (Currently Amended) The system as set forth in claim 16, wherein the superconducting quantum ~~interface~~ interference device is located in a substantially cryogenic environment, and the first and second unbalanced RF coaxial transmission lines extend between the cryogenic environment and the non-cryogenic environment.

18. (Currently Amended) The system as set forth in claim 16, wherein the unmodulated flux locked loop includes -

a controlled-impedance bias tee for sending the bias current into the superconducting quantum ~~interface~~ interference device and for receiving the output signal generated by the superconducting quantum ~~interface~~ interference device via the second unbalanced RF coaxial transmission line;

an impedance match for terminating the second unbalanced RF coaxial transmission line in a characteristic impedance of the second unbalanced RF coaxial transmission line;

a low noise amplifier for amplifying the output signal of the superconducting quantum ~~interface~~ interference device;

a loop gain adjustment for optimizing performance of the unmodulated flux locked loop;

a first DC amplifier for amplifying an output of the low noise amplifier;

a first integrator network for facilitating achieving a stable phase locked feedback of the output signal of the superconducting quantum ~~interface~~ interference device, wherein the first integrator network is a first passive lead-lag network;

a second DC amplifier for providing a wideband signal gain;

an offset adjustment for adjusting a DC offset of an output of the first integrator network;

a second integrator network operating in conjunction with the first integrator network to provide performance of a two-pole integrator, wherein the second integrator network is a second passive lead-lag network;

an output amplifier for amplifying an output of the second integrator network; and

a matching combiner for matching a characteristic impedance of the first unbalanced RF coaxial transmission line.

19. (Currently Amended) The system as set forth in claim 16, wherein the first unbalanced RF coaxial transmission line is impedance matched at the unmodulated flux locked loop and is not impedance matched at the superconducting quantum ~~interface~~ interference device.

20. (Currently Amended) The system as set forth in claim 16, wherein the second unbalanced RF coaxial transmission line is impedance matched at the unmodulated flux locked loop and is not impedance matched at the superconducting quantum ~~interface~~ interference device.

21. (Currently Amended) The system as set forth in claim 16, wherein the first and second unbalanced RF coaxial transmission lines are impedance matched at both the unmodulated flux locked loop and the superconducting quantum ~~interface~~ interference device.